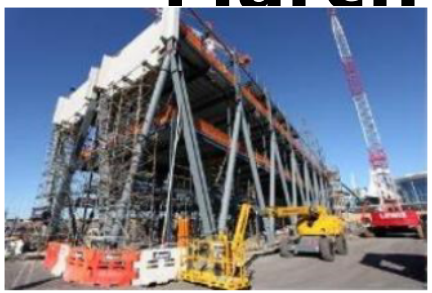
Ensuring the compliance of structural steelwork regardless of origin

Christchurch City Council Engineers Forum

March 2016



Presenter: Alistair Fussell
SCNZ Manager

Presentation overview

- Introduction – Why the fuss?
- Structural steel construction and the Building Code
- The role of the construction reviewer
- Industry compliance initiatives
- Conclusions

Notes:

1. Presentation based on SESOC paper (to be published)
2. Qualifiers
   a) Much of content relevant to steelwork regardless of origin
   b) Not all international fabrication companies are a problem

Imported fabricated steelwork - What is the fuss?

- Things are changing in the way construction materials and products are procured – including structural steelwork
  - Historically –reliable procurement supply chains (often Australasian source)
  - Now – Global supply chains (low cost Asian countries)
    - cost driven
    - cultural/geographical barriers
    - lack of robust standards compliance requirements
    - change of delivery model
    - often ill-equipped construction reviewers

The result -“a perfect compliance storm”, increased risk of non-compliance for engineers, builders and building consent authorities

So what's the solution to this new problem?

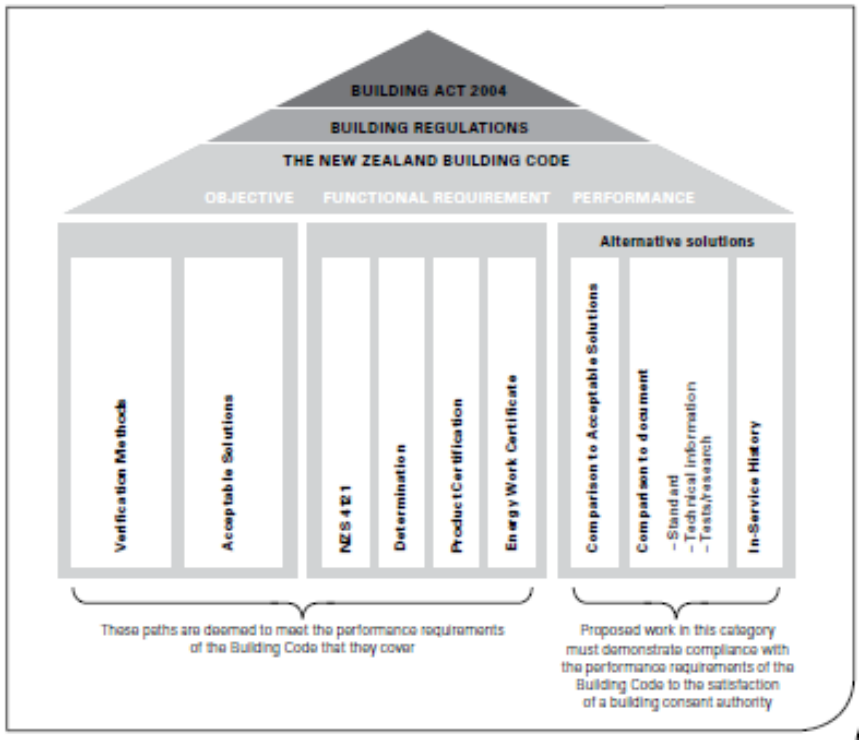
Competent Construction Reviewers

Supported by:
- Training
- Best Practice Compliance Guidance
- Improved standards

- Building Act – A Qualified person verifies compliance
- NZS 3404 – Recognises a Construction Reviewer
  - Required to review all stages of construction
  - Typically a professional engineer, who on the basis of experience or qualifications is competent to undertake this review
    - How do BCA's recognise such people?
  - Can nominate representatives to act their behalf eg weld engineering, weld inspectors

Steel Construction and the Building Code

Demonstrating compliance with the Building Code

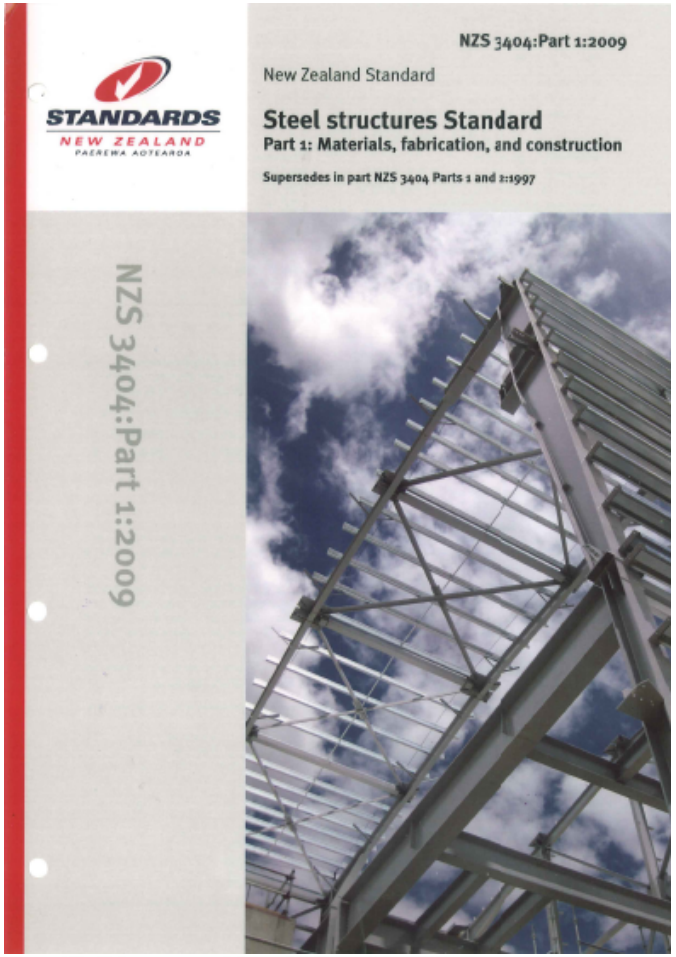


Steel design and construction: AS/NZS 1170 and NZS 3404

Technical requirements for steel construction in NZ

NZS 3404 and NZS 1554.1 key documents, include:

1. Performance requirements
2. Fabrication process limitations
3. Product conformance
4. NZ specific seismic provisions



The Role of the Construction Reviewer

The role of the construction reviewer

Construction monitoring role:

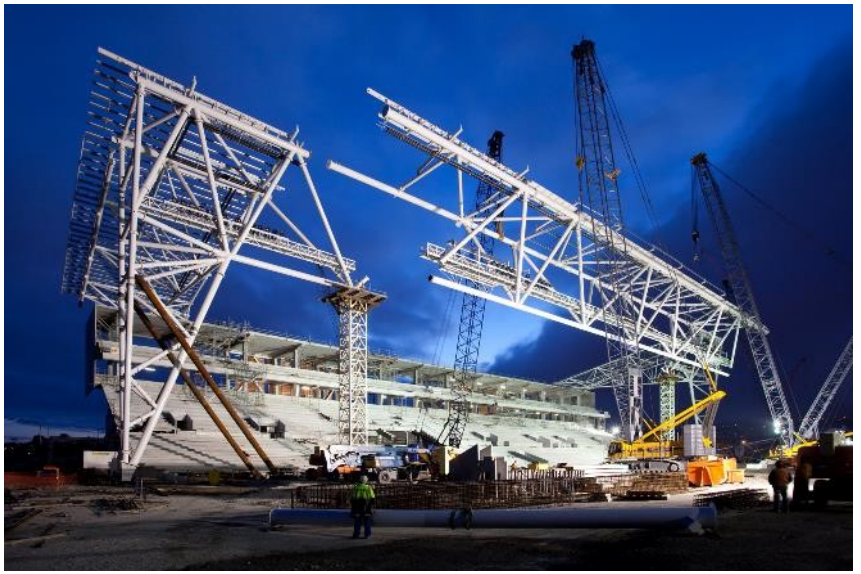
- Ensure design correctly interpreted
- Construction techniques don’t compromise design
- Work is generally in accordance with plans and specification

Construction review – structural steel projects

1. Review shop drawings
2. Address matters to be resolved AS/NZS 1554.1
3. Arrange third party inspections/ NDT
4. Review fabricator execution documents (mill certificates, weld inspection reports)
5. Undertake inspections in shop and site
6. **Ensure fabricator is operating a production control system**
7. Issue PS4

Specific to imports

8. **Approve use of alternative materials**



Key issues to focus on

- Alternative materials
  - Approval
  - Acceptance
- Fabricator production control systems
- Picking your support team

Approval of alternative steels

NZS 3404.1:2009

- Recognises AS/NZS;EN;JIS and some ASTM and API steel grades
- Alternative steels
  - Alternative solution
  - Expert assessment to determine equivalency to recognised steel grades (competencies: Structural reliability, metallurgy, welding engineering)
  - Ambiguous requirement (chemistry + structural reliability)

Acceptance of steels –low cost Asian countries

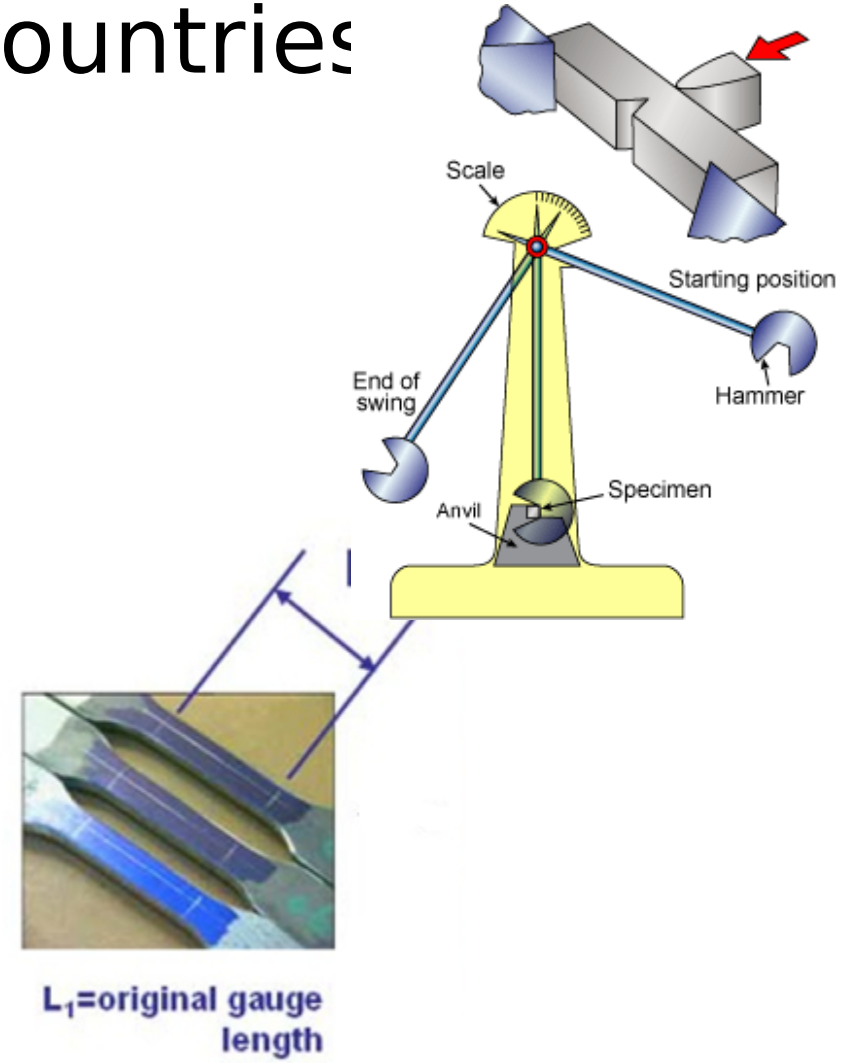
Singapore BCA Alternative Steels document - 2 options

Option 1

- Third party certified FPC (QA system +ITP)
- Compliant test report

Option 2

- 100% visual inspection (tolerances + surface defects)
- Batch testing steels at “trusted” independent test facility
- Compliant test report



Fabricator Production Controls

Implementation of fabricator production control system essential

- Quality assurance system (Personnel + procedures)
- ITP (execution documents)
- Fit for purpose
- Implications for steelwork contractor selection

Construction Reviewer

- Ensure appropriate system and implemented
  - Content (SESOC paper, ISO 9001 not necessarily enough)
  - Third party certified ideal
  - Must have trusted inspector in workshop to verify system implemented
- Fabricator execution documents + third party inspection/testing = evidence of compliance

Give attention to: Welding

Special process

- Not easy to determine compliance after the fact for welded structures
- Robust QA systems must be in place during work and appropriate QC (inspection and testing)

WELDING PROCEDURE SPECIFICATION

Material spec/grade	AS/NZS 1163 C350 To AS/NZS 3679.1 G300		
Fabricator	Example Engineering Ltd.	WPS no.	EE2
Standard	AS/NZS 1554.1:2014	Date	2.3.15
Process	FCAW	PQR No	EG2
Edge preparation	Square	Page	1 of 1
Welding direction	NA	Revision	0 Date NA
Range qualified	Fillet weld ≤ 5mm leg length Combined thickness ≤ 36mm	Positions	1F, 2F, 4F
Preheat temperature	NA	PWHT	NA
Method and check method	NA		
Inter-run temperature (max.)	NA		

Joint sketch / Run sequence

Joint tolerance

Prequal. Joint no.	F1
To Table	E3
Root gap G mm	+ 1.5mm
Root face F, mm	NA
Incl.angle θ°	NA
Backing	NA

WELDING CONSUMABLES

Specification - Root	AS/NZS ISO 17632	Flux	NA
Classification - Root	B-T493U		
Shielding gas	CO_2	Flow rate	15 –17 l/min
Purge gas	NA	Flow rate	NA

Weld run details					Welding parameters				
No.	Side	Position	ϕ mm	Tradename	Amps	Voltage	Current And polarity	Speed mm/mn	Heat Input KJ/mm
1	1	1F, 2F, 4F	1.2	Wunda-Core	240-260	27-29	DCEP	250-330	1.2-1.8

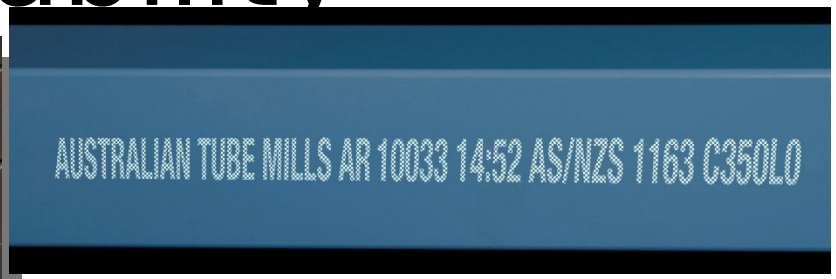
Technique		Stringer/weave	
Single-run or multi-run	Single	Electrical stick-out	20-25 mm
Initial cleaning	NA	Backgouge	NA
Inter-run cleaning	NA	Gouge check	NA

Notes/revisions
1. NA – Not Applicable

Approved by
A. Lincoln
AS 2214 Welding Supervisor

EXAMPLE

Give attention to traceability



NZS 3404 – Treat as unidentified steel if traceability lost

Pick your support team carefully in low cost countries

Cultural factors to consider

- Ethics
  - Fraudulent mill certificates
  - Ductile mesh
- Reluctance to fail non conforming product/ workmanship

Reputable international QA companies with local inspectors no guarantee of good outcome

- Supplement with trusted international personnel
- Undertake some material testing in NZ

Managing your risk

- Be proactive in steelwork contractor selection (in ideal world)
  - Tender stage
  - Client selection
- Find competent inspection/ test resource
- Ensure fees reflect reflects time and risk
  - Additional resource required
  - Pre-warn client, construction monitoring costs will be higher if imports used
  - Educate client on pro and cons of import options
- Be prepared to walk

Industry Compliance Initiatives

Industry compliance initiatives

- Guidance
  - Articles
  - Checklists
  - 2 part Guide 2016
    - Part 1 Alternative steels
    - Part 2 Ensuring compliance of fabricated steelwork
- Training
- Standards (AS/NZS 5131- 2016?)
- Call SCNZ/HERA

Conclusions

- Construction reviewers have an important role to play in global procurement market
  - Globalisation has raised the non-compliance risk
- To fulfil role responsibly, construction reviewers need to:
  - Be competent or team with experts who are
  - Be appropriately paid for service
  - Have a trusted third inspection party operating in fabricators workshop
  - Ensure proper due diligence before signing up steelwork contractor

Questions?